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(54) Procedure for the manufacturing of double layer resistive thin film integratad resistors through ion erosion.

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DE-A-3 200 983
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NAVY TECHNICAL DISCLOSURE BULLETIN, vol. 8, no. 4, June 1983, pages 83-86, Washington, US; H. MORRIS "A dual resistivity thin film hybrid microcircuit"
PATENT ABSTRACTS OF JAPAN, vol. 5, no. 176 (E-81)848r, 12th November 1981 & JP - A - 56 101 764

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Description

The invention relates to a method for producing an integrated resistor heving a dual resistivity thin film layer according to the preamble of claim 1.

In the article of Hayden Morris (Nevy Technical Disclosure Bulletin, vol. 8, no. 7 (1983.06), pages 83 to 86) a method of employing more than one film of resistive material to form resistors of the ssme microcircuit substrate is disclosed, in which a substrate of glass, ceramic or the like is completely covered by a high resistivity film layer using a sputtering technique. Next, a low resistivity film layer is deposited such that is overlays the first film layer, and the low resistivity film layer is then overcoated with a metallization film layer. A plurality of conductor patterns and resistor pattern ereas are dellneated ueing photolithographic masking and etching techniques. The microcircuit aubstrate with the pattern areas is then anneeled in e vacuum or inert atmosphere, and the low resistivity film leyer is etched ewey in one of the resistor pattern eraas. Without affecting the high resistivity film layer resulting in this film forming tha resistor in this erea.

DE—A 32 00 983 refera to an electrical network heving e aubstrete with two different resistivity layers, e.g. CrSi and NiCr which are deposited by sputtering or evaporetion techniques. Thin film resiators having different resistivities are reelized by forming a conductive layer (Cu) on top of the aeid two layers; selective etching eteps are performed by employing e petterned photomesk to delimitete said resistors.

A simller microcircuit is known from DE—A 27 57 519 of the applicant in which on e single raaiative layer of NiCr a second conductive leyer of Au ia deposited and then chemically etched. The etched ereas are electrolitically covered by a Nl meak, end then the microcircuit substrate is completely covered by a Au layer which ie also maaked by a Nl pettern. Naxt, the Au areas not covered by the mask ere etched eway by an ion etching step end the meske (Ni) removed.

In order to cover e large range of values, particularly in the case of high resistances for low surface resistivity and of low resistancea for high surface resistivity, single resistivity circuits are subject to three limitations:

—manufacture of very narrow resistive paths (10 to 20 µm) is inaccurate, difficult to produce and to trim and has a high rejection rate;

—the meender lines need large surfaces;

—it is impossible to realize both high and low resistances.

It is an object of the invention to provide an improved method for producing a microcircuit having at least two different surface resistivities by sequentially depositing layers of different resistive material and a conductor and subsequently etching the assembly in a sole ion erosion phase.

This object is accomplished by the invention as claimed. It is particularly applicable in the field of hybrid circuits and microwave integrated circuits.

Further advantages of the invention will become apparent from the following description of e preferred example with reference to the drawing which illustrates the manufacture steps for producing an integrated microcircuit having a low and a high resistive layer.

As illustrated in part a, a substrate 10 of alumina (Al_2O_3) is coated by RF sputtering with a high resistivity film layer 12 of cermet. In the following step b, said cermet layer 12 is photomasked by a photopolymer 14, e.g. AZ 1350 H. In c is illustrated the electrolytic growth of the mask 16 of Ni having a thickness of about 2 µm; the photopolymer 14 is then removed.

Next (step d), a low resistivity film layer 18 of NiCr is deposited by a RF sputtering technique, which is then—step e—photomasked by e photopolymer 20 (AZ 1350 H). Similar to step c, In the following step f is illustrated the electrolytic growth of the mask 22 of Nl having a thickness of about 2 µm; the photopolymer 20 is then removed.

In step g, an antidiffusive conductive triple leyer 24 is deposited, e.g. NiCr—Pt—Au, which is aubsequently (step h) photomasked by patterna 26. Again (step i) wa have an elactrolytic growth of a mask 28 of Ni having a thickneaa of about 3 µm; the photopolymar patterns 26 are then removed.

In step 1, the areas not covered by the maaks ere etched by an ion attack technique. Finelly, the residuel Nl masks 16, 22 and 26 are removed (atep m).

According to the invention it ia possible to obtein, with a single etching step, at least two different resistivity arees on a aubstrete.

Claim

Method for producing a multi resistivity thin film microcircult having a substrate (10) which is covered by at least two leyers (12, 18) of different resistive meteriel end e conductive leyer (24), characterized in that the different reaistive layers (12, 18) ere directly provided in the desired resistor ereas with a mask (16, 22) which is electrolytically grown In the openings of photopolymer layers (14, 20), whlch ara in turn removed, in that the covering conductive layer (24) is also masked by a photopolymer in which a pattern (26) is provided for the electrolytic growth of a further mask (28), after which said photopolymer layer (26) ia removed, and in that the areas not covered by the residual masks (16, 22, 28) are etched away in a single step by ion attack before removing said residual masks.

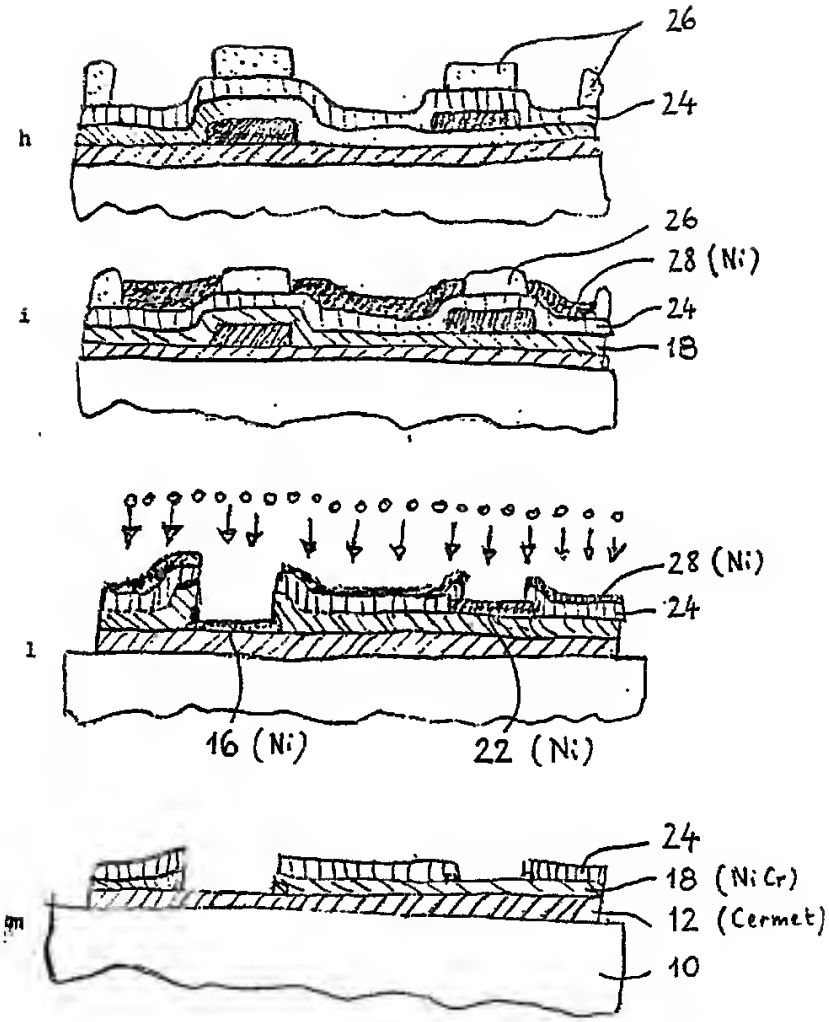
Patentanspruch

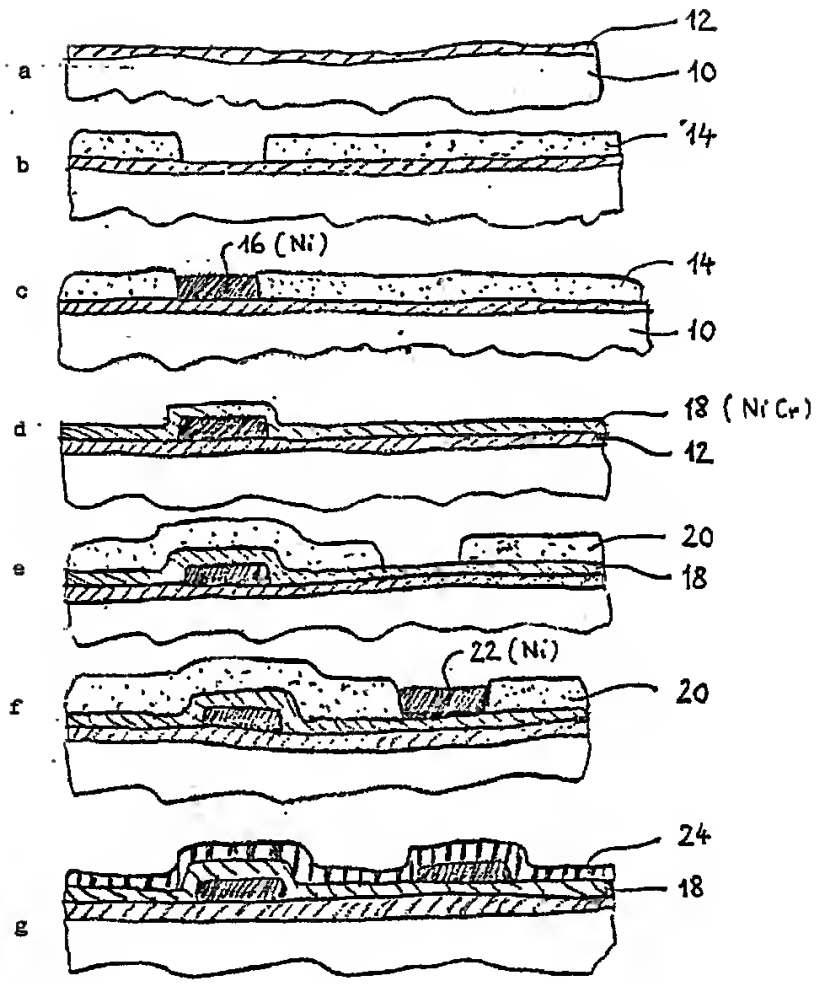
Verfahren zum Herstellen einer mehrere spezifische Widerstände aufweisenden Dünnschicht-Mikroschaltung mit einem Substrat (10), das von mindestens zwei Schichten (12, 18) aus unterschiedlichem Widerstendsmaterial und einer leitenden Schicht (24) bedeckt ist, dadurch gekennzeichnet, daß die unterschiedlichen Widerstands-

schichten (12, 18) direkt in den gewünschten Widerstandsbereichen mit einer Maske (16, 22) gebildet werden, die elektrolytisch durch Wachstum in den Öffnungen von Photopolymerschichten (14, 20) gebildet wird, welche ihrerseits entfernt werden, daß die abdeckende leitende Schicht (24) ebenfalls durch ein Photopolymer maskiert wird, in welchem für das elektrolytische Wachstum einer weiteren Maske (28) ein Muster (26) vorgesehen ist, woraufhin die Photopolymerschicht (26) beseitigt wird, und daß die nicht von den Rest-Photomasken (16, 22, 28) bedeckten Bereiche in einem einzigen Schritt durch Ionenerosion fortgeätzt werden, bevor die Rest-Masken entfernt werden.

Revendication

Procédé pour produire un microcircuit ou microstructure à couche mince de résistivités multiples comportant un substrat ou support (10) recouvert d'au moins deux couches (12, 18) de substances de résistivités différentes et une couche conductrice (24), caractérisé en ce que les couches résistives différentes (12, 18) sont directement pourvues, dans les différentes zones de résistance, d'un masque (16, 22) qui est formé par croissance électrolytique dans les ouvertures des couches d'un photopolymère (14, 20) qui sont, à leur tour, enlevées, en ce que la couche conductrice de couverture (24) est également masquée au moyen d'un photopolymère comportant un tracé (26) pour permettre la croissance électrolytique d'un deuxième masque (28), en ce qu'ensuite, on enlève ladite couche photopolymère (26) et en ce que les zones non couvertes par les masques résiduels (16, 22, 28) sont enlevées par gravure en une seule étape au moyen d'une technique d'érosion ionique avant d'enlever lesdits masques résiduels.


h
26
24
i
26
28 (Ni)
24
18
l
28 (Ni)
24
16 (Ni)
22 (Ni)
m
24
18 (NiCr)
12 (Cermet)
10


a
12
10
b
14
c
16 (Ni)
14
10
d
18 (NiCr)
12
e
20
18
f
22 (Ni)
20
g
24
18